That which is claimed is:

1. A joint resistant to fluid leakage, which joint comprises a girdle of a metallic material capable of undergoing deformation without rupture that is disposed between and contiguous with tapered mating surfaces of a first rigid member and a second rigid member, wherein differential pressure across the joint provides compressive force upon the girdle through the mating surfaces thereby improving resistance to fluid leakage through the joint.

2. The joint according to claim 1 wherein the first rigid member comprises a nonmetallic material selected from the group consisting of glass, porcelain, and ceramic, and the second rigid member comprises a high strength metallic material capable of being welded, and the members exhibit different coefficients of thermal expansion.

3. The joint according to claim 1 wherein the girdle has a monolithic structure that undergoes plastic deformation thereby improving resistance to fluid leakage through the joint.

4. The joint according to claim 1 wherein the first rigid member includes a ceramic material comprising a crystalline mixed metal oxide which exhibits, at operating temperatures, electron conductivity, oxygen ion conductivity, and ability to separate oxygen from a gaseous mixture containing oxygen and one or more other components by means of the conductivities.

5. The joint according to claim 4 wherein the first rigid member has a tubular structure closed at one end with a tapered outer surface at a distal end of the rigid member which tapered surface is contiguous with a portion of the girdle.

6. The joint according to claim 5 wherein the girdle has a monolithic structure comprising a metallic material that has undergone plastic deformation thereby improving resistance to fluid leakage through the joint.

7. A joint resistant to fluid leakage, which joint comprises a first rigid member which has a tubular structure closed at one end with a tapered outer surface at a distal end thereof comprising a nonmetallic material selected from the group consisting of glass, porcelain, and ceramic; a girdle which has a tapered inner surface adapted to support the tapered outer surface of the first member, the girdle comprising a metallic material capable of undergoing deformation without rupture; and a second rigid member which has an orifice adapted to support the girdle, the second rigid member comprising a high strength metallic material capable of being welded, wherein a differential pressure across the joint provides compressive force upon the girdle.

8. The joint according to claim 7 wherein the nonmetallic material of the first rigid member and the high strength metallic material contiguous with the girdle exhibit different coefficients of thermal expansion.

9. The joint according to claim 8 wherein the first rigid member includes a dense ceramic material comprising a crystalline mixed metal oxide which exhibits, at operating temperatures, electron conductivity, oxygen ion conductivity, and ability to separate oxygen from a gaseous mixture containing oxygen and one or more other components by means of the conductivities.

10. The joint according to claim 7 wherein the girdle has a monolithic structure that undergoes plastic deformation thereby improving resistance to fluid leakage through the joint.

11. A joint resistant to fluid leakage, which joint comprises a composite girdle comprising two or more materials at least one of which materials is capable of undergoing deformation without rupture, a conduit comprising a metallic material capable of being welded with an inner tapered surface at a distal end thereof adapted to mate with an outer surface of the girdle, and a hollow ceramic member having at least one opening for flow

communication with the conduit and an outer tapered surface adjacent to the opening adapted to mate with an inner surface of the girdle, wherein a differential pressure across the joint provides compressive force upon the girdle through the mating surfaces.

12. The joint according to claim 11 further comprising a mechanical means that provides compressive force upon the girdle through the mating surfaces.

13. The joint according to claim 11 wherein the ceramic member comprises a crystalline mixed metal oxide composition selected from a class of materials that have an X-ray identifiable crystalline structure based upon the structure of the mineral perovskite, $CaTiO_3$.

14. The joint according to claim 11 wherein the conduit comprises a high temperature alloy of at least one metallic element selected from the group consisting of aluminum, titanium, vanadium, chromium, iron, cobalt, nickel, molybdenum, and tungsten.

15. The joint according to claim 11 wherein the girdle has a monolithic structure comprising at least one metallic element selected from the group consisting of aluminum, copper, zinc, palladium, silver, tin, antimony, platinum, gold, lead and bismuth.

16. The joint according to claim 11 wherein the composite girdle comprises graphite imbedded in a metallic material capable of undergoing plastic deformation without rupture that is disposed between and contiguous with tapered mating surfaces.

17. The joint according to claim 11 wherein the girdle has a monolithic structure which comprises graphite with a coating of at least one metallic element selected from the group consisting of palladium, silver, platinum and gold, disposed to contact fluid on at least one side of the joint.

.18. A process to convert organic compounds into value-added products, which process comprises:

(a-18) Providing a membrane reactor comprising a plurality of joints according to claim 1 or claim 11 wherein the ceramic member comprises a dense ceramic membrane comprising a crystalline mixed metal oxide which exhibits, at operating temperatures, electron conductivity, oxygen ion conductivity, and ability to separate oxygen from a gaseous mixture containing oxygen and one or more other components by means of the conductivities;

(b-18) Maintaining, at low pressure, a flow into the hollow ceramic member through the hollow girdle of an oxygen-containing gaseous mixture having a relatively high oxygen partial pressure;

(c-18) Contacting, at high pressure, the outer surface of the hollow ceramic member with a gaseous composition having a relatively lower oxygen partial pressure; and;

(d-18) Permitting oxygen to be transported through the dense ceramic membrane by means of its electron conductivity and oxygen ion conductivity thereby separating oxygen from the oxygen-containing gaseous mixture having a relatively higher oxygen partial pressure into the gaseous composition having a relatively lower oxygen partial pressure.

19. The process according to claim 18 wherein the dense ceramic membrane permeable to oxygen comprises a crystalline mixed metal oxide composition represented by

$$(D_{1-y}\, M'_{y})_{\alpha}\,(E_{1-x}\, G_{x})_{\alpha+\beta}\, O_{\delta}$$

where D is a metal selected from the group consisting of magnesium, calcium, strontium, and barium, M' is a metal selected from the group consisting of magnesium, calcium, strontium, barium, copper, zinc, silver, cadmium, gold, mercury, yttrium, lanthanum and the lanthanides, E is an element selected from the group consisting of vanadium, chromium, manganese, iron, cobalt, and nickel, G is an element selected

from the group consisting of vanadium, chromium, manganese, iron, cobalt, nickel, niobium, molybdenum, technetium, ruthenium, rhodium, palladium, indium, tin, antimony, rhenium, lead, and bismuth, with the proviso that D, E, G and M' are different elements, y is a number in a range from about zero to about one, x is a number in a range from about zero to about one, α is a number in a range from about 0.1 to about 4, β is a number in a range from 0 to about 20, with the proviso that

$$1 \leq (\alpha + \beta)/\alpha \leq 6,$$

and δ is a number which renders the compound charge neutral.

20. The process according to claim 18 wherein the gaseous composition having a relatively lower oxygen partial pressure contains one or more organic compounds, and reacting at least one of the organic compounds with the oxygen transported through the membrane to form oxidation products at temperatures in a range from about 500° C to about 1150° C.

21. The process according to claim 18 wherein the gaseous composition having a relatively lower oxygen partial pressure contains one or more organic compounds selected from the group consisting methanol, dimethyl ether, ethylene oxide, and hydrocarbons containing 1 to about 20 carbons, and the reaction products include synthesis gas comprising carbon monoxide and molecular hydrogen.

22. The process according to claim 18 wherein the gaseous composition having a relatively lower oxygen partial pressure is maintained at total pressure in a range upward from total pressure of the oxygen-containing gaseous mixture to obtain the differential pressures of at least 15 pounds per square inch across the joint which thereby provides compressive force upon the girdle through the mating surfaces.

23. The process according to claim 22 wherein the dense ceramic membrane permeable to oxygen comprises the crystalline mixed metal oxide composition represented by

$$La_{0.2}Sr_{0.8}Fe_{0.8}Cr_{0.2}O_{3-\delta}$$

where δ is a number that renders the compound charge neutral.

24. The process according to claim 23 wherein the gaseous composition having a relatively lower oxygen partial pressure contains one or more organic compounds, and reacting at least one of the organic compounds with the oxygen transported through the membrane to form oxidation products at temperatures in a range from about 500° C to about 1150° C.

25. The process according to claim 24 wherein the gaseous composition having a relatively lower oxygen partial pressure comprises methane, and the reaction products include synthesis gas comprising carbon monoxide and molecular hydrogen.